

Governor's Water Augmentation,
Innovation, and Conservation Council
Long-Term Water Augmentation Committee
August 3, 2021



Agenda

- I. Welcome – *Wade Noble, Committee Chair*
- II. Recap and Introduction – *Carol Ward, ADWR Deputy Assistant Director*
- III. Enhanced Aquifer Recharge – *Keith Nelson, ADWR Senior Research Hydrologist*
- IV. Storage Sites Subcommittee Update – *Carol Ward, ADWR Deputy Assistant Director*
- V. Next Steps
- VI. Adjournment



Webinar Logistics

- Indicate you wish to speak by typing your name in the chat box, and you will be invited to unmute and speak. Please message “Everyone” in the chat.
- Please state your name when speaking.
- Mute yourself when not speaking.
- If you have a written comment, please message “Everyone” in the chat.
- The meeting and chat will be recorded.

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I. Welcome

Wade Noble, Committee Chair



II. Recap and Introduction

Carol Ward, ADWR Deputy Assistant Director

Past Efforts to Explore Potential for Enhanced Aquifer Storage

It is important to think about the possibility and perhaps necessity of enhanced stormwater recharge projects in the context of the hotter, drier future that may already be upon us, while still acknowledging the concerns that have been raised for these types of projects in the past.



Variation in Potential Project Type and Scale

- Can occur on multiple scales
 - Regional scale = flood water capture and conveyance
 - Local scale = managed projects within a riverbed or constructed projects such as injection wells
 - Neighborhood/individual scale = Green Infrastructure and Low Impact Development (LID)
- Can utilize multiple types of water
 - Reclaimed, surface, urban enhanced runoff (UER)*, CAP, etc.
- Can have multiple benefits, such as flood control



Explore Potential for Stormwater Harvesting

- Today's presentation by ADWR Senior Research Hydrologist, Keith Nelson, covers the **potential for enhanced recharge of stormwater, at a regional scale**
- Guiding questions to keep in mind for the discussion:
 - What needs to be better understood from a technical, regulatory, or legislative perspective in order to move forward with these discussions?
 - What hurdles will need to be overcome, to make this a viable water augmentation solution?





III. Enhanced Aquifer Recharge

Keith Nelson, ADWR Senior Research Hydrologist

Enhanced Recharge

What is Enhanced Recharge?

- Enhances the natural recharge process with the **goal of introducing additional water to the aquifer, which may otherwise be lost.**
- Potential for enhanced recharge is dependent on the **physical feasibility** of an area.
- Physical feasibility is determined by an area's physical characteristics including:
 - Soil/substrate, depth to water, aquifer composition, topography, etc.

Enhanced Recharge Potential in Arizona

Where has enhanced recharge proven to be successful?

- **Nogales, AZ/Santa Cruz AMA (SCAMA)** - example of municipal water system that benefits from periodic, renewable **flood recharge** and proactive water management

Other areas where potential enhanced recharge could be *physically* feasible (*regardless of other considerations*)?

- **Potential for enhanced flood recharge in the Prescott AMA**
 - Granite Creek, Lynx Creek

Enhanced Recharge Potential in Arizona

Why is this important?

- Many groundwater flow systems in AZ are in **overdraft**

What other benefits?

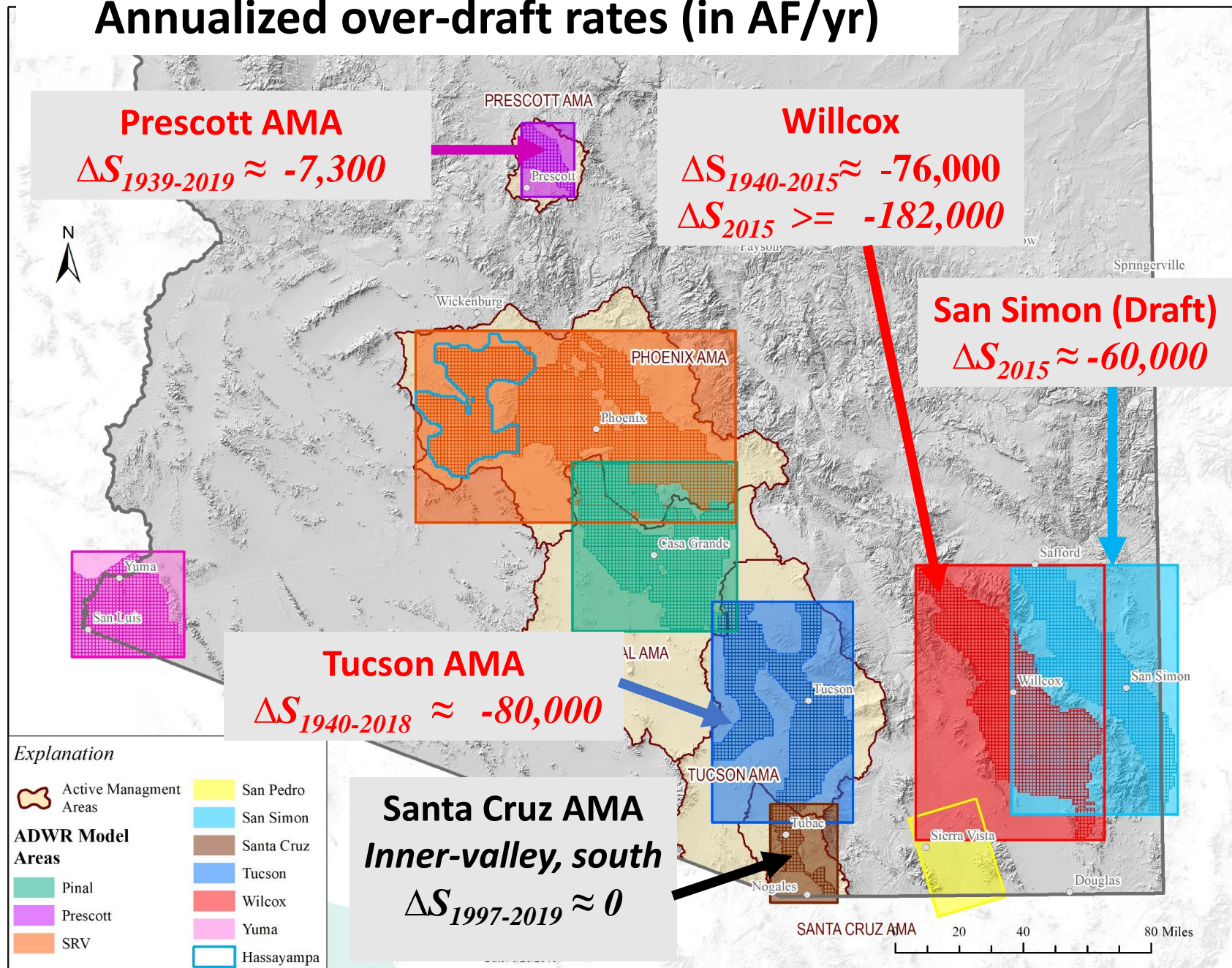
- 1) Interested in **recharging precipitation** that otherwise evaporates
 - Precipitation-Evaporation rate is **97.65%** in Prescott AMA, **97.9%** in Wilcox Basin, and **88.9%** in SCAMA
- 2) Has the potential to **mitigate flood damage**; increasing urbanization

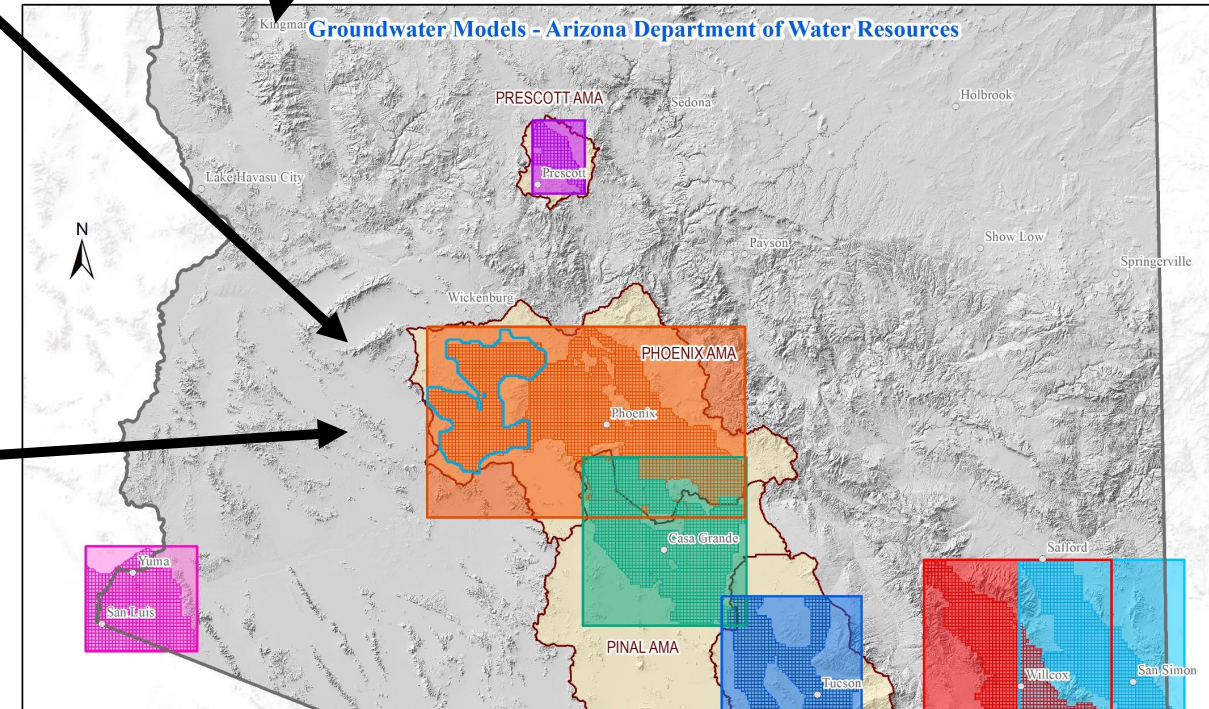
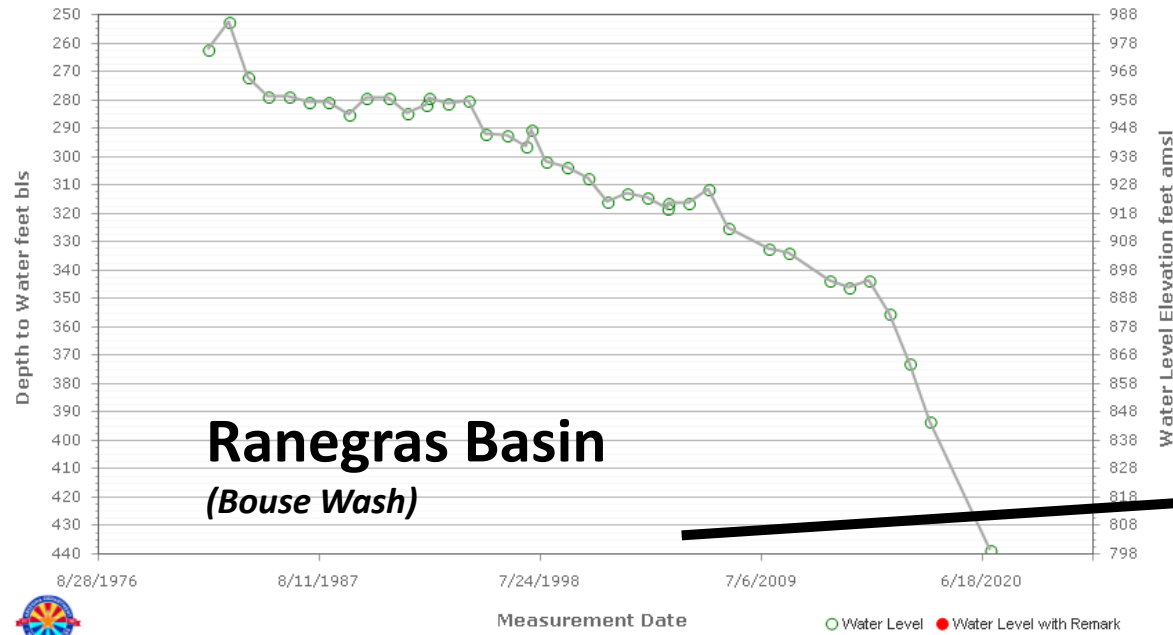
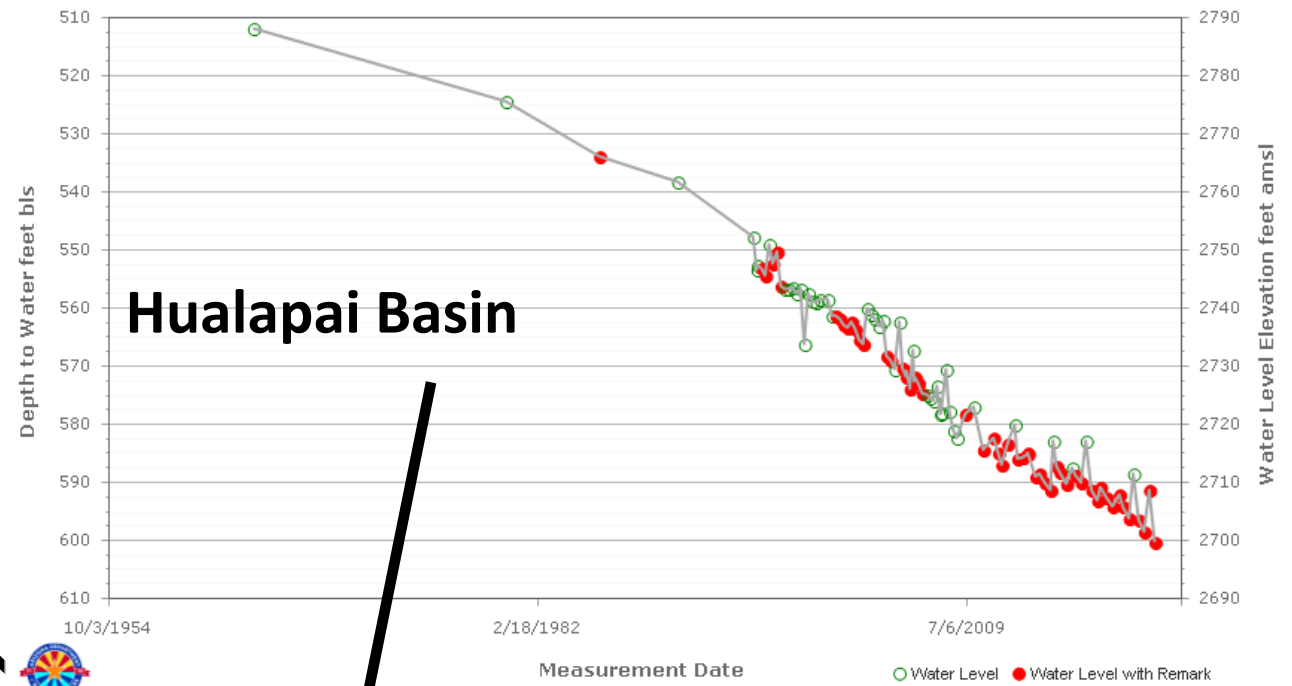
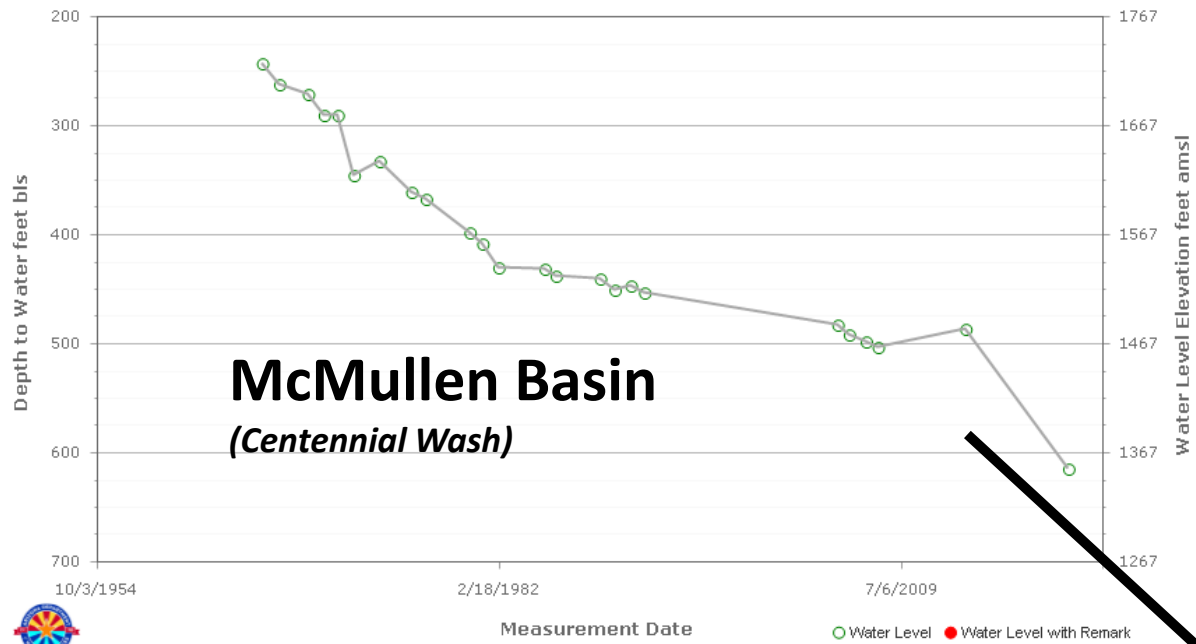
Can use regional-scale groundwater flow models to inform recharge location

All recharge sites are NOT equal!

- **Mountain front recharge (MFR)** vs. **Concentrated flood recharge**
- **Willcox & San Simon** vs. **Upper Santa Cruz; Upper Agua Fria**

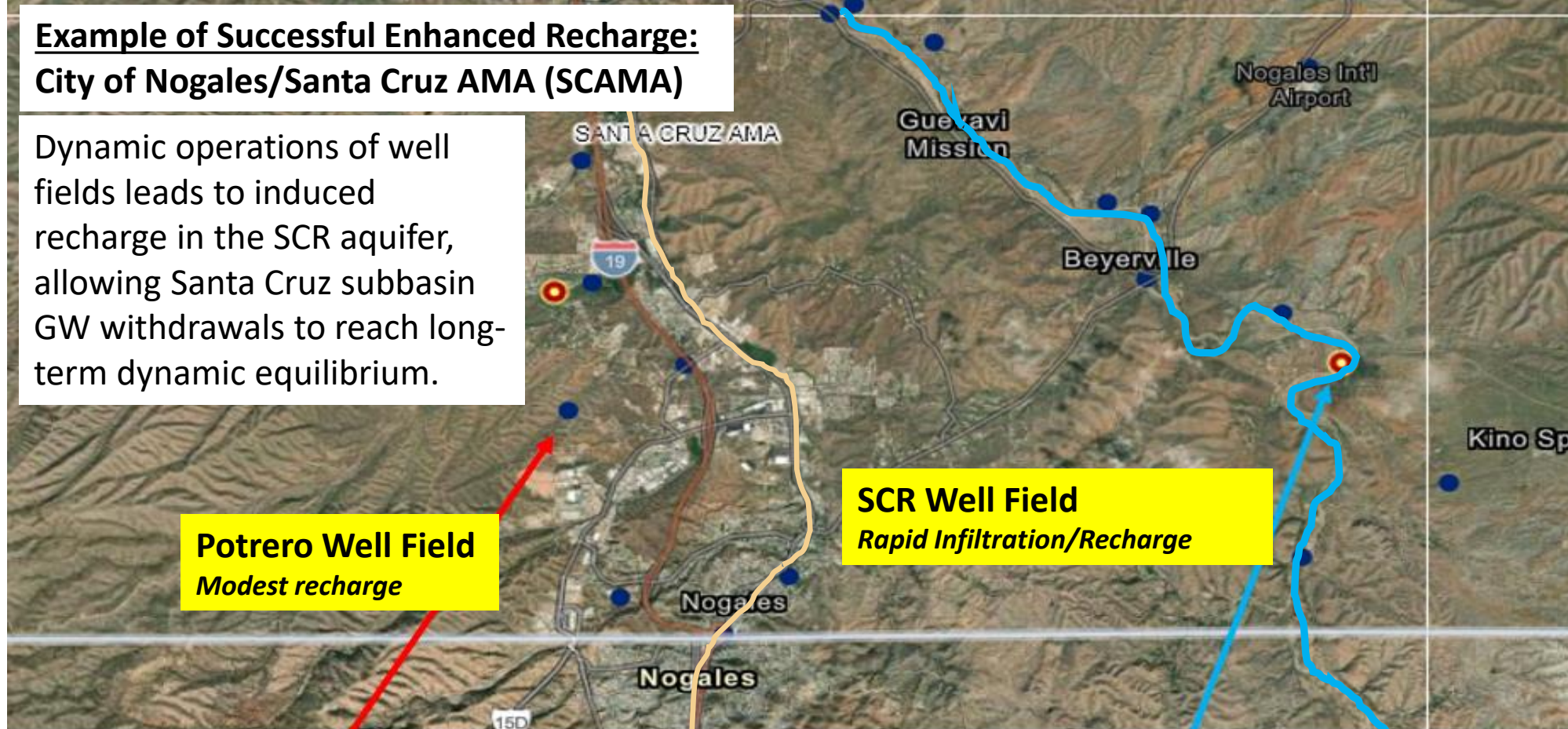
Annualized over-draft rates (in AF/yr)





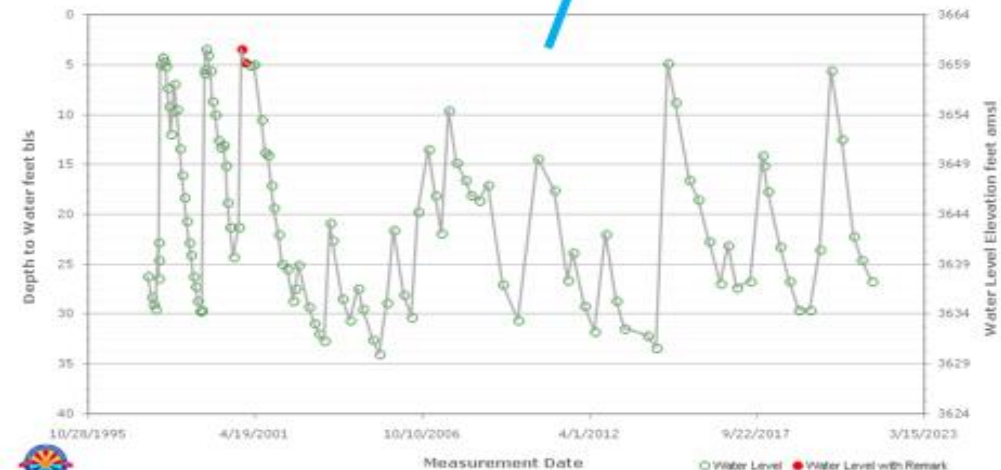
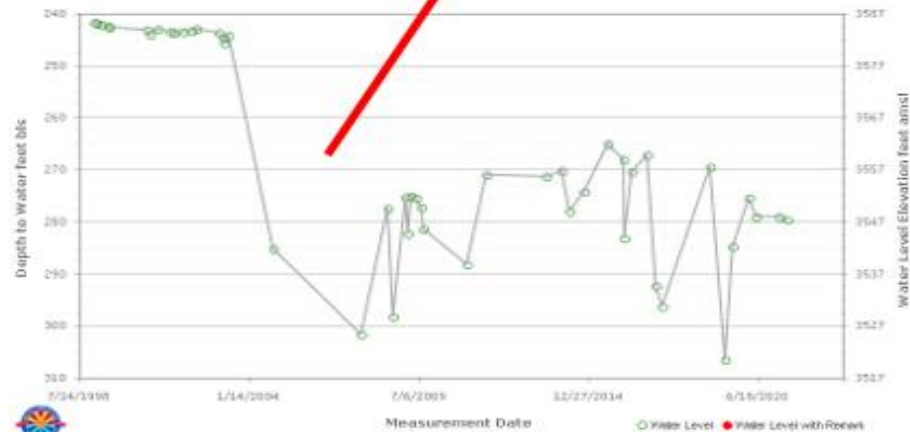
Example of Successful Enhanced Recharge: City of Nogales/Santa Cruz AMA (SCAMA)

Dynamic operations of well fields leads to induced recharge in the SCR aquifer, allowing Santa Cruz subbasin GW withdrawals to reach long-term dynamic equilibrium.



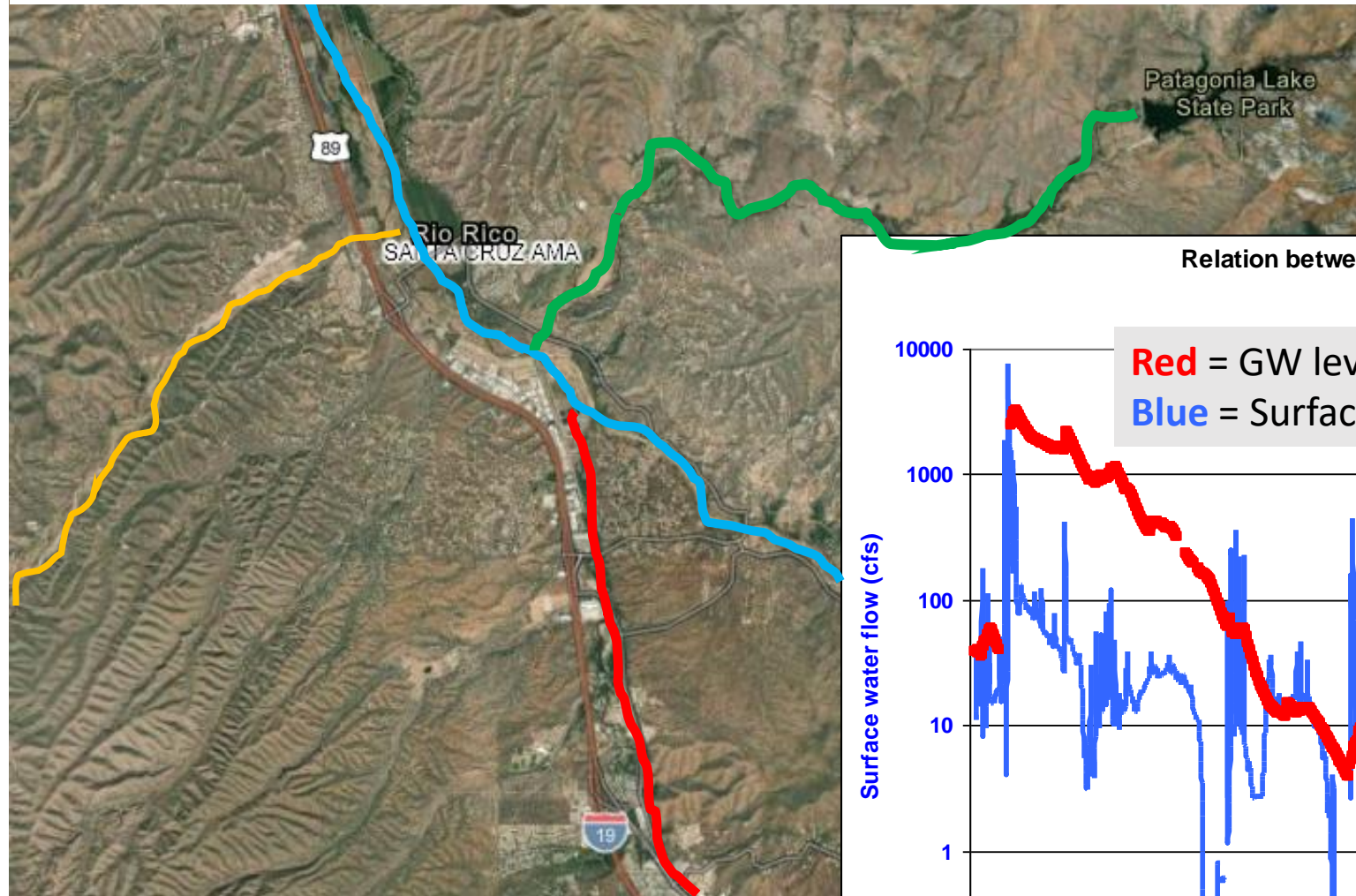
Potrero Well Field
Modest recharge

SCR Well Field
Rapid Infiltration/Recharge

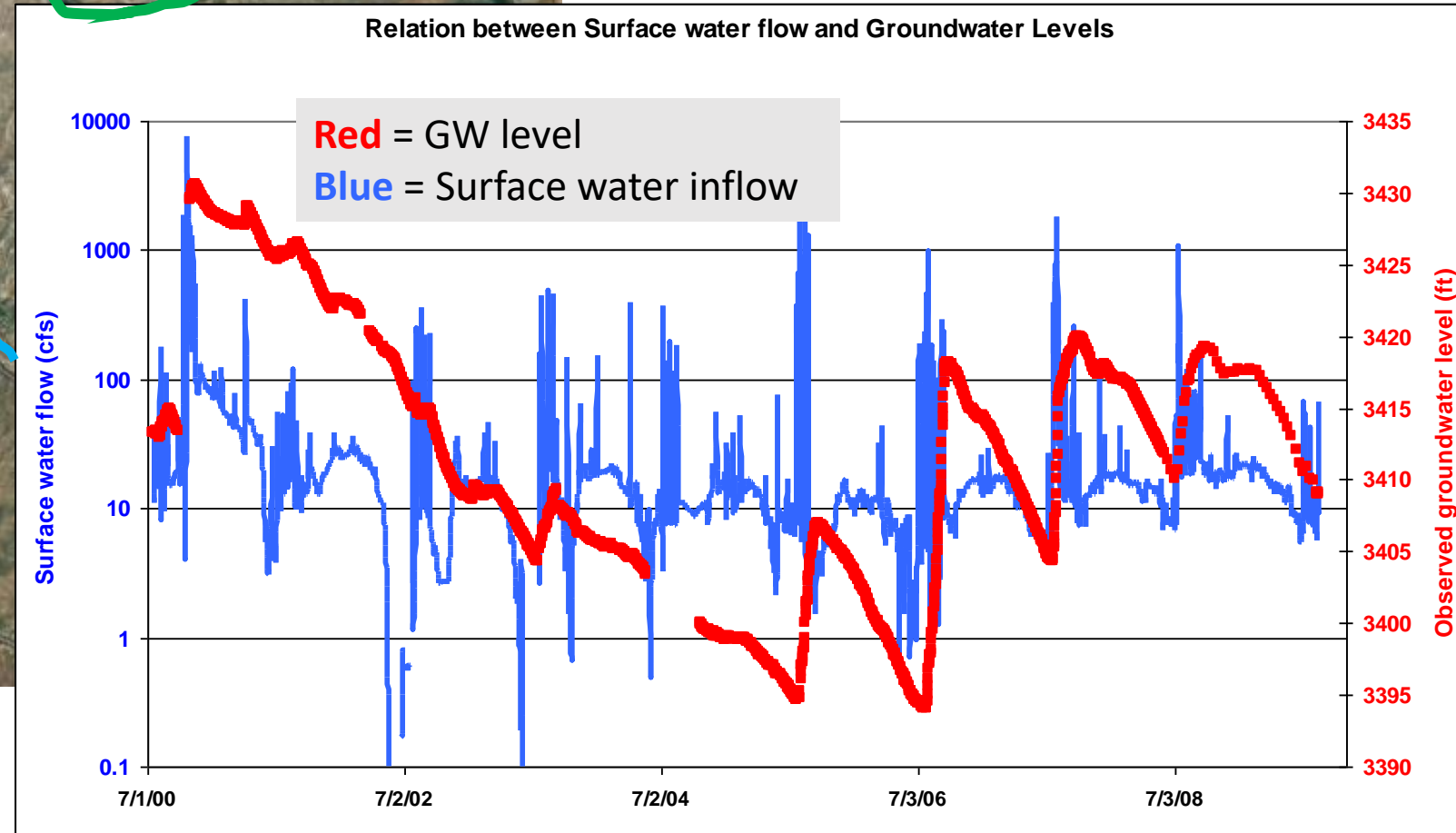


Why Does It Work So Well?

Excellent recharge efficiency:
losing reach, permeable soils, &
concentration of tributaries to
convey flood waters.



Santa Cruz River Confluence
with **Nogales Wash**, **Sonoita**
Creek and **Agua Fria Creek**

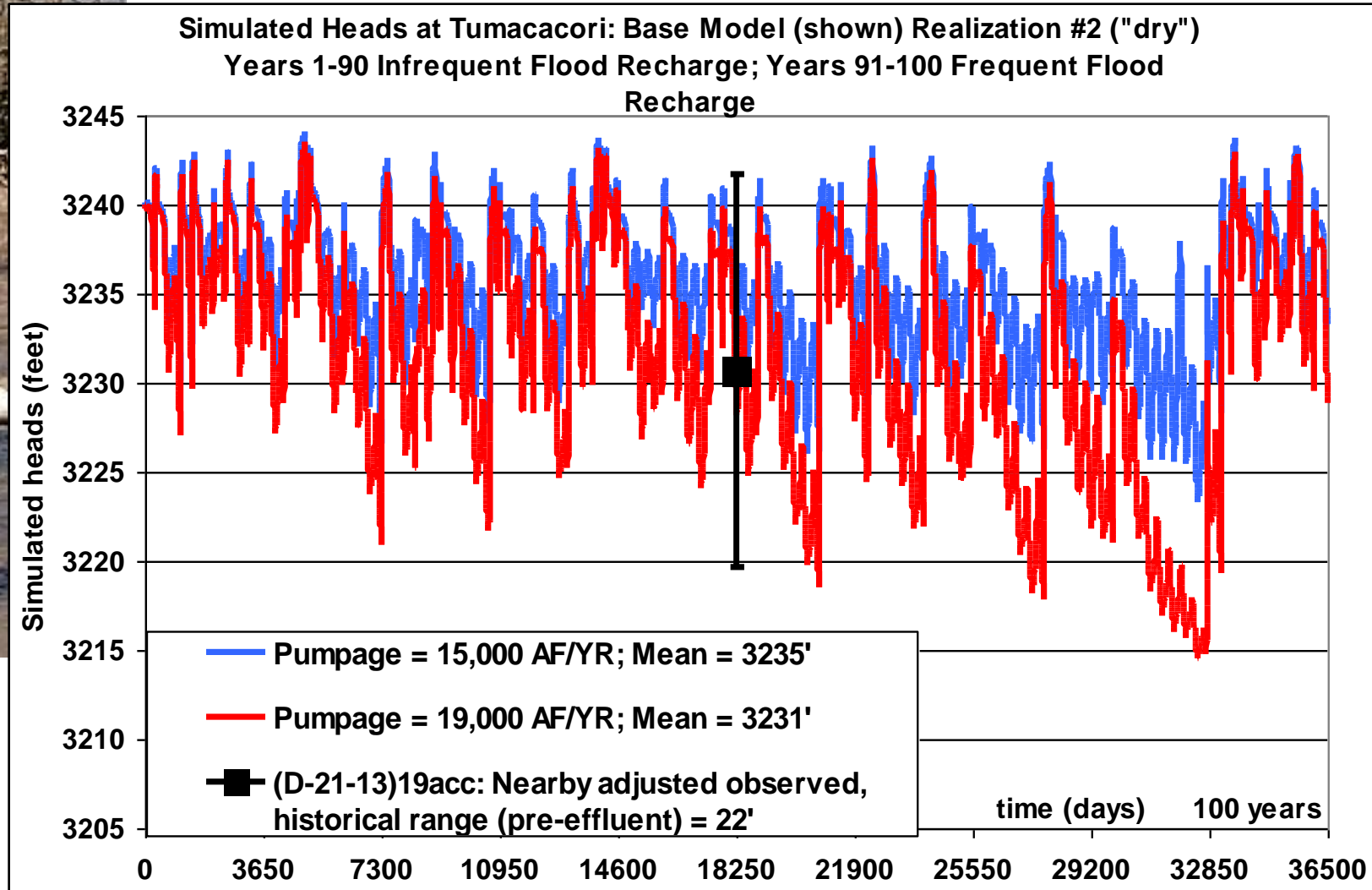


GW levels decreasing from 2000 to approx. 2005. In 2005 GW level start increasing. Highlights potential to offset withdrawals with increased flood water recharge.

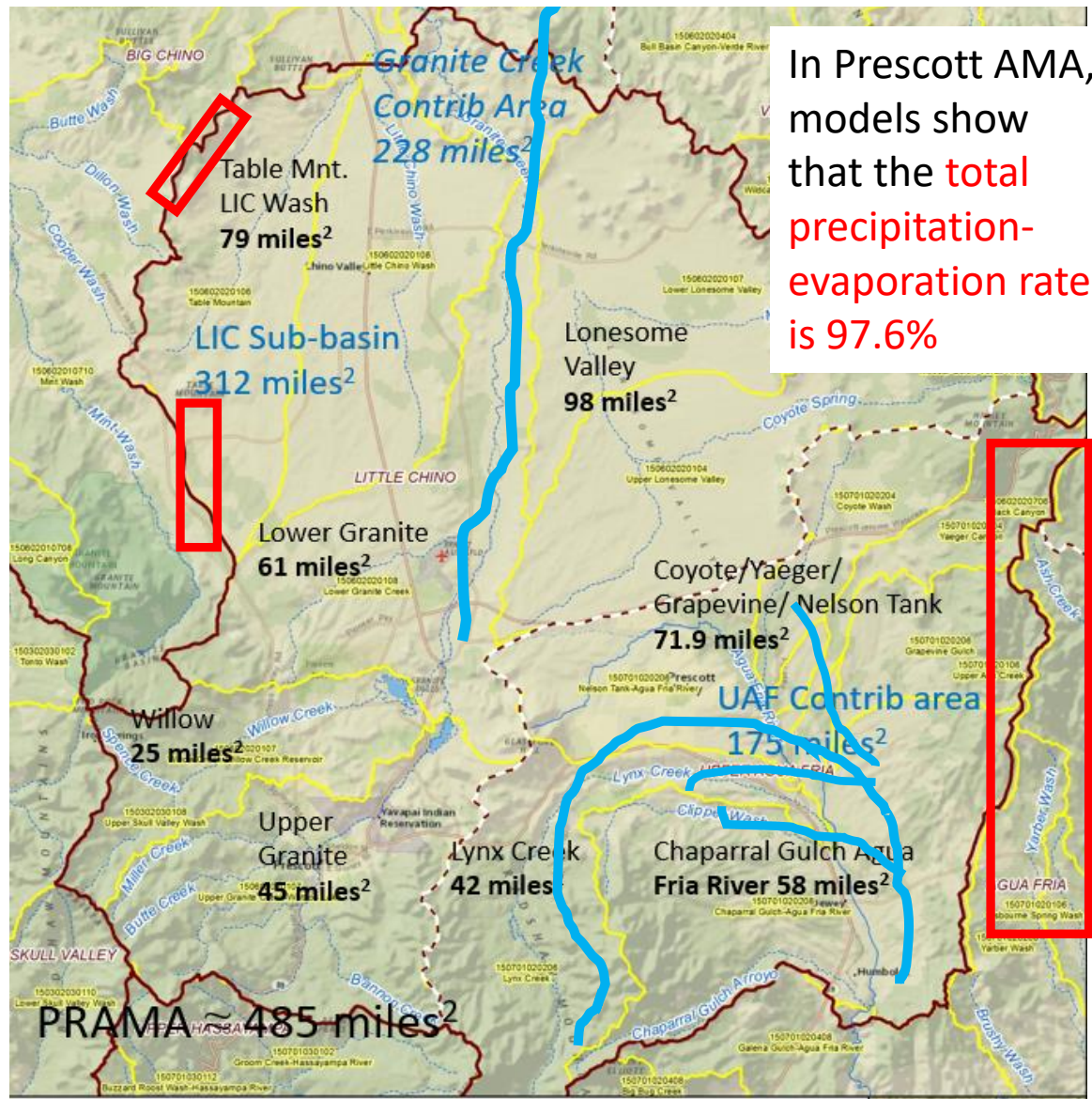
Induced Recharge Concept: Where conditions are favorable, pumping can create storage space for subsequent flood recharge.



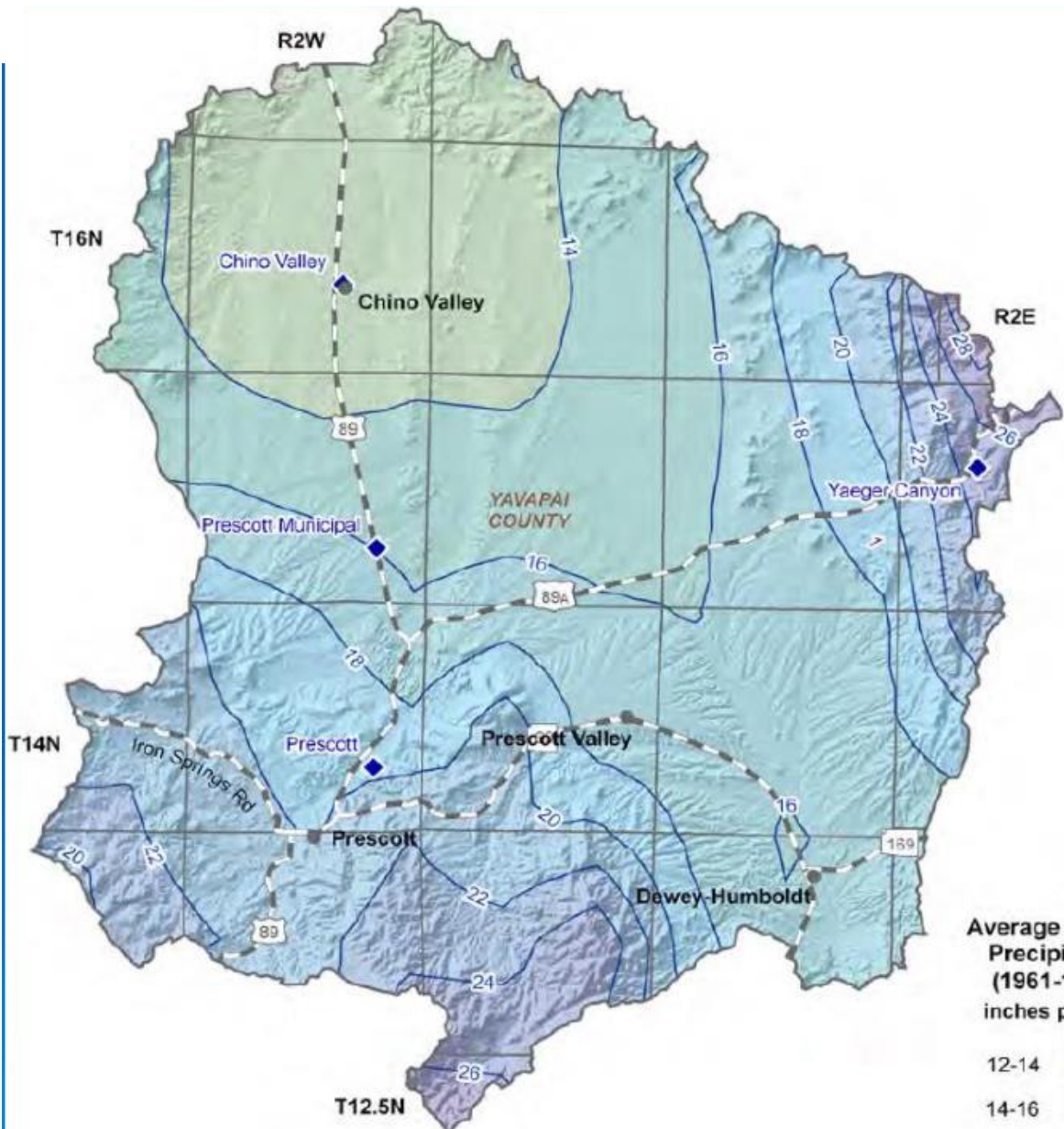
Photo of Santa Cruz River

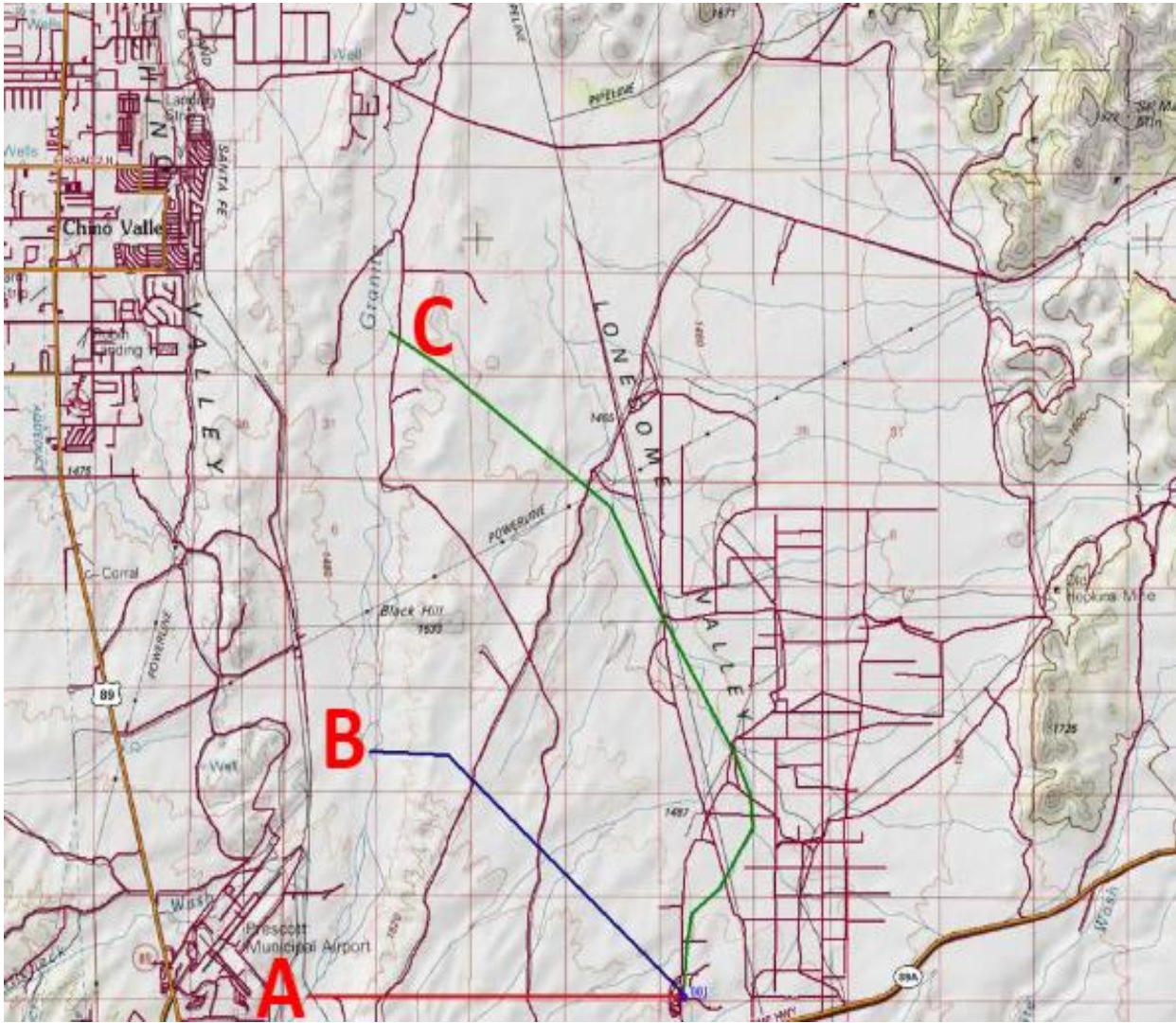


Enhanced Recharge Potential in the Prescott AMA:
Potential to reduce evaporative loss by directing runoff
to locations where recharge is *physically feasible*



Average Annual Precipitation (in.)





Cross-sections **A, B, & C** show 3 potential pathways for conveying water from **Lonesome Valley** (high evap/low recharge potential) to **Granite Creek** (high recharge potential).

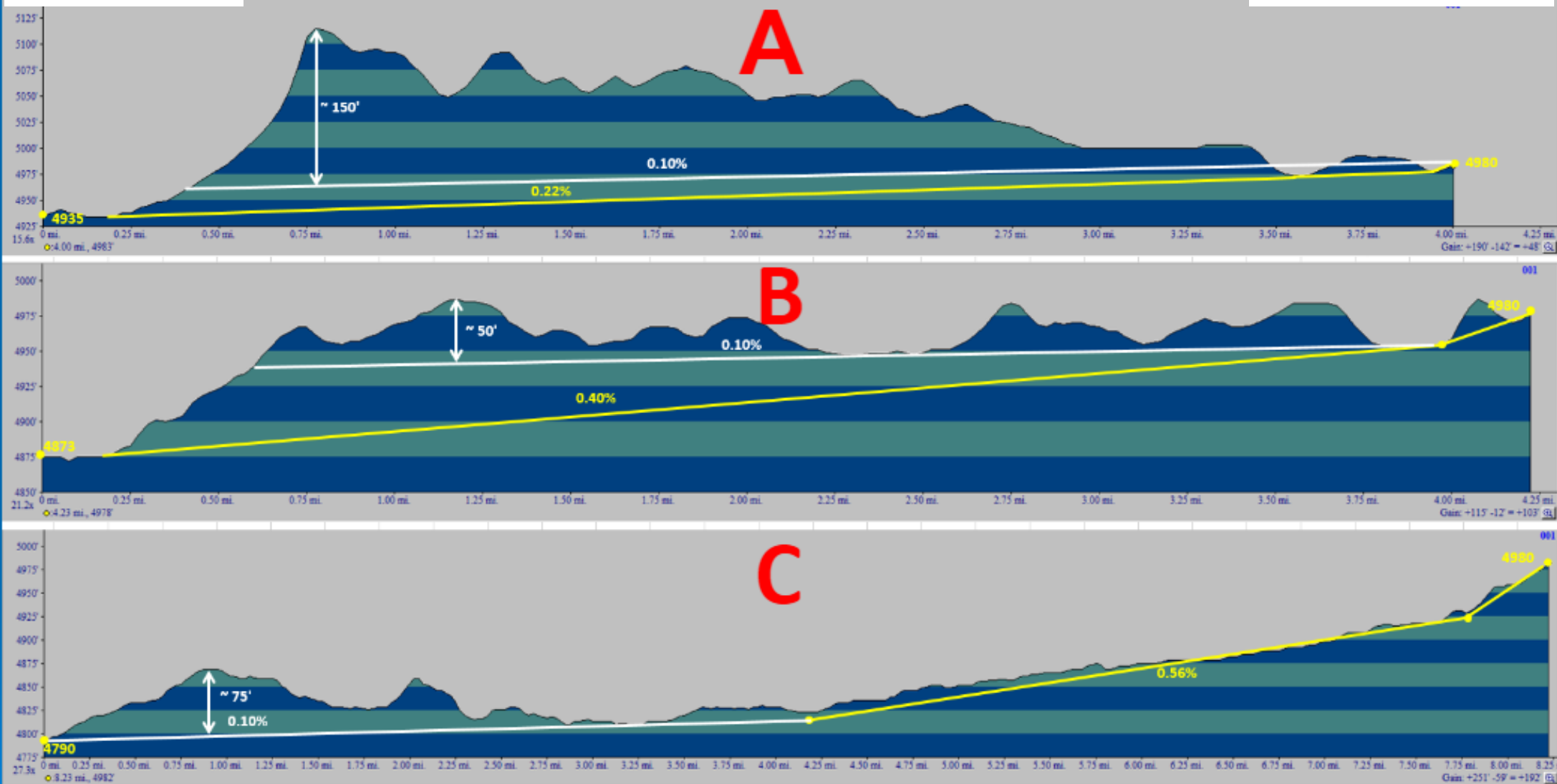
Courtesy of Doug McMillan, Civil Engineer

Profiles For Three Transport Alternatives

Courtesy of Doug McMillan, Civil Engineer

Granite Creek

Lonesome Valley



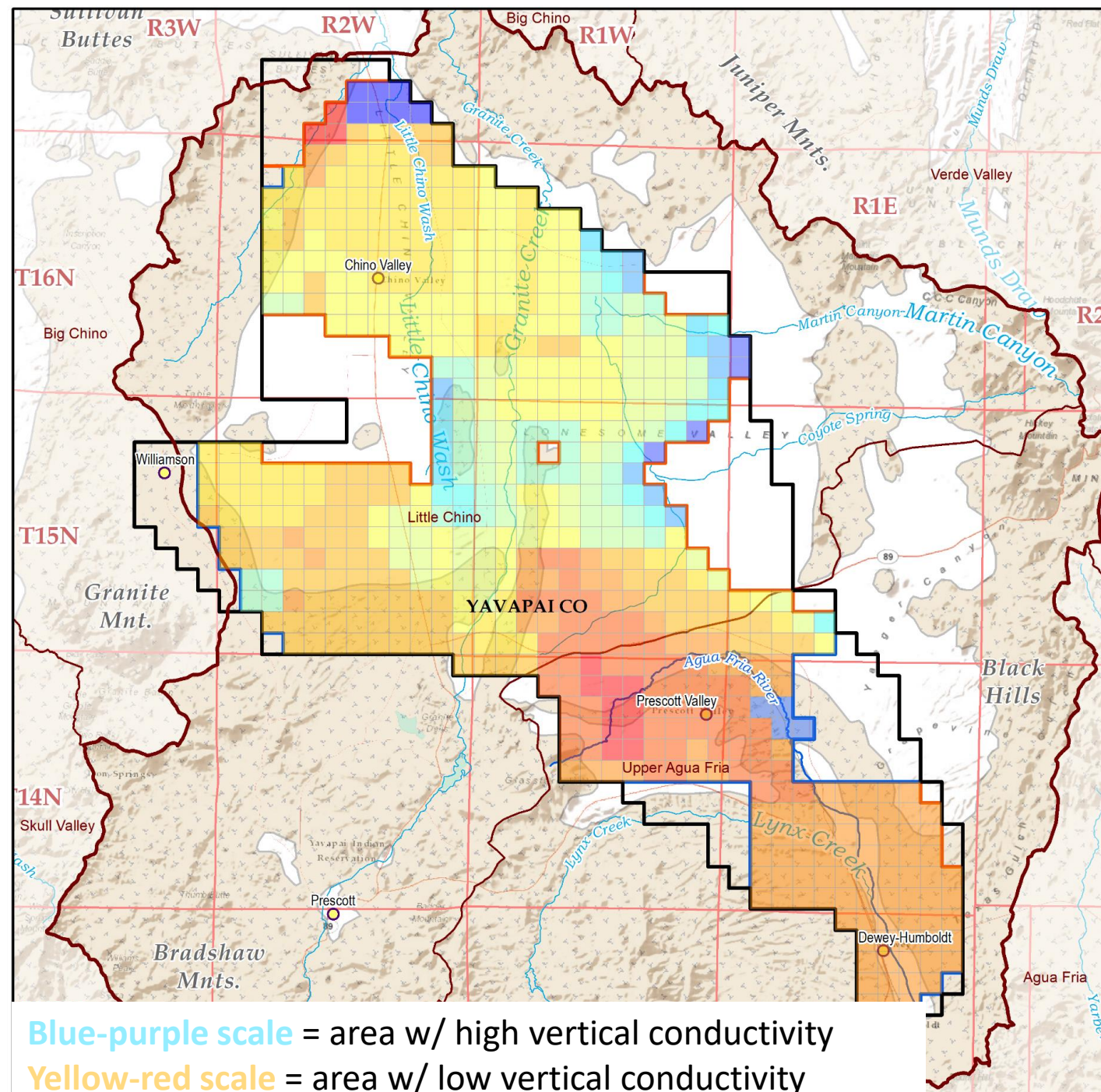


Enhanced Recharge can potentially Reduce Overdraft:

Step 1: Convey runoff that would otherwise evaporate to Granite Creek

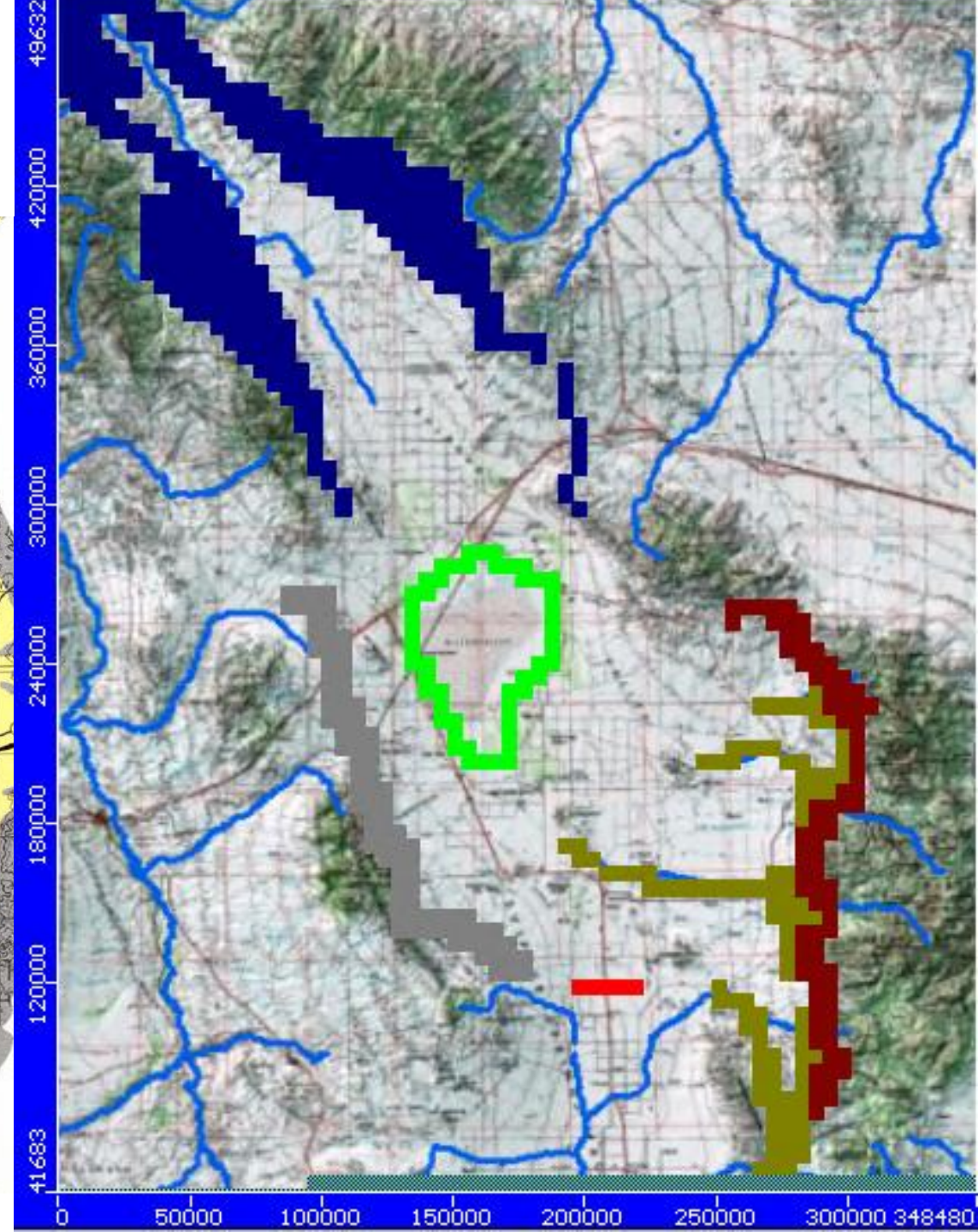
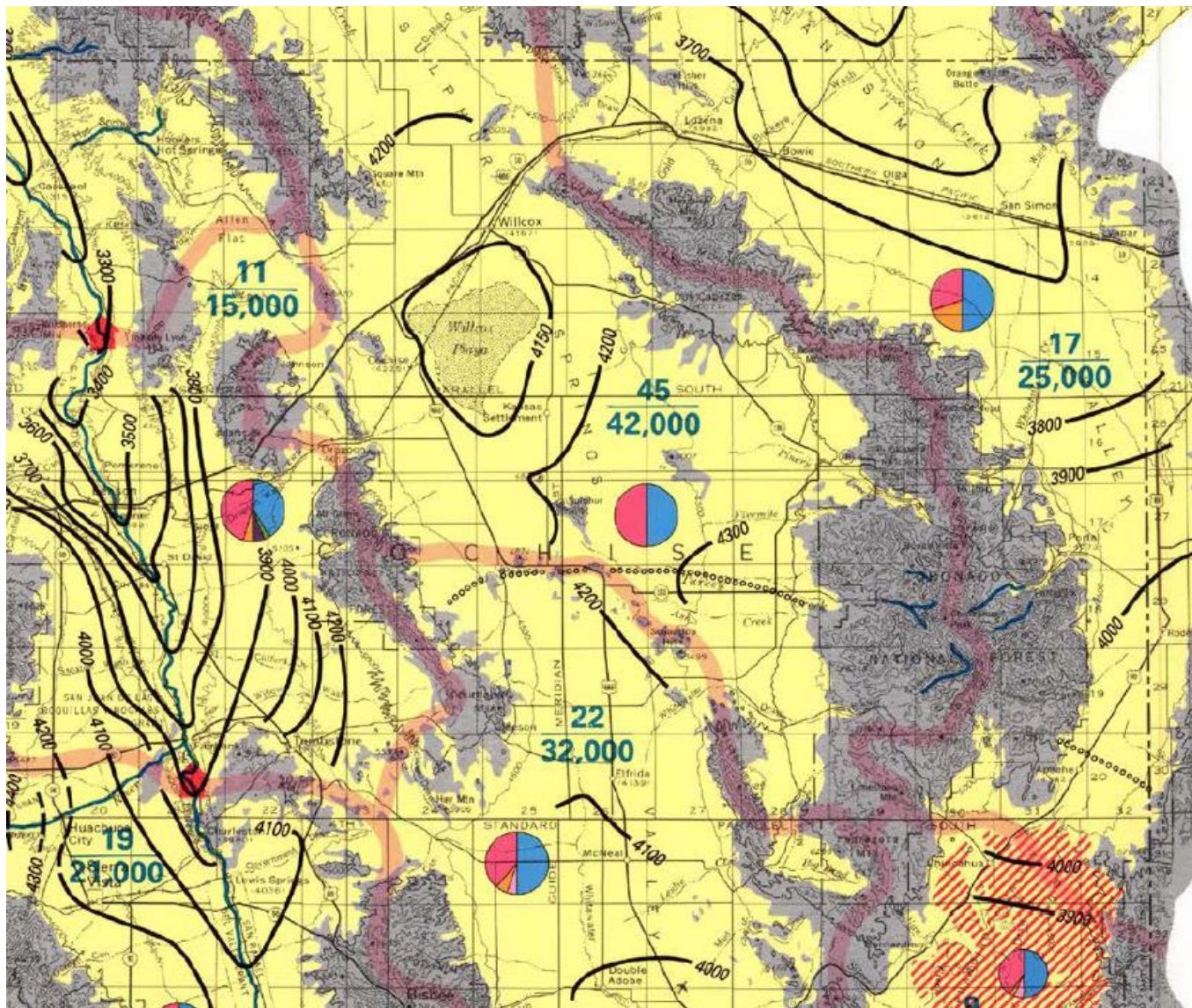
Step 2: Concentrate the conveyed water to areas with high vertical conductivity.

- Allows water to reach lower aquifer (depth at which large production wells are screened)



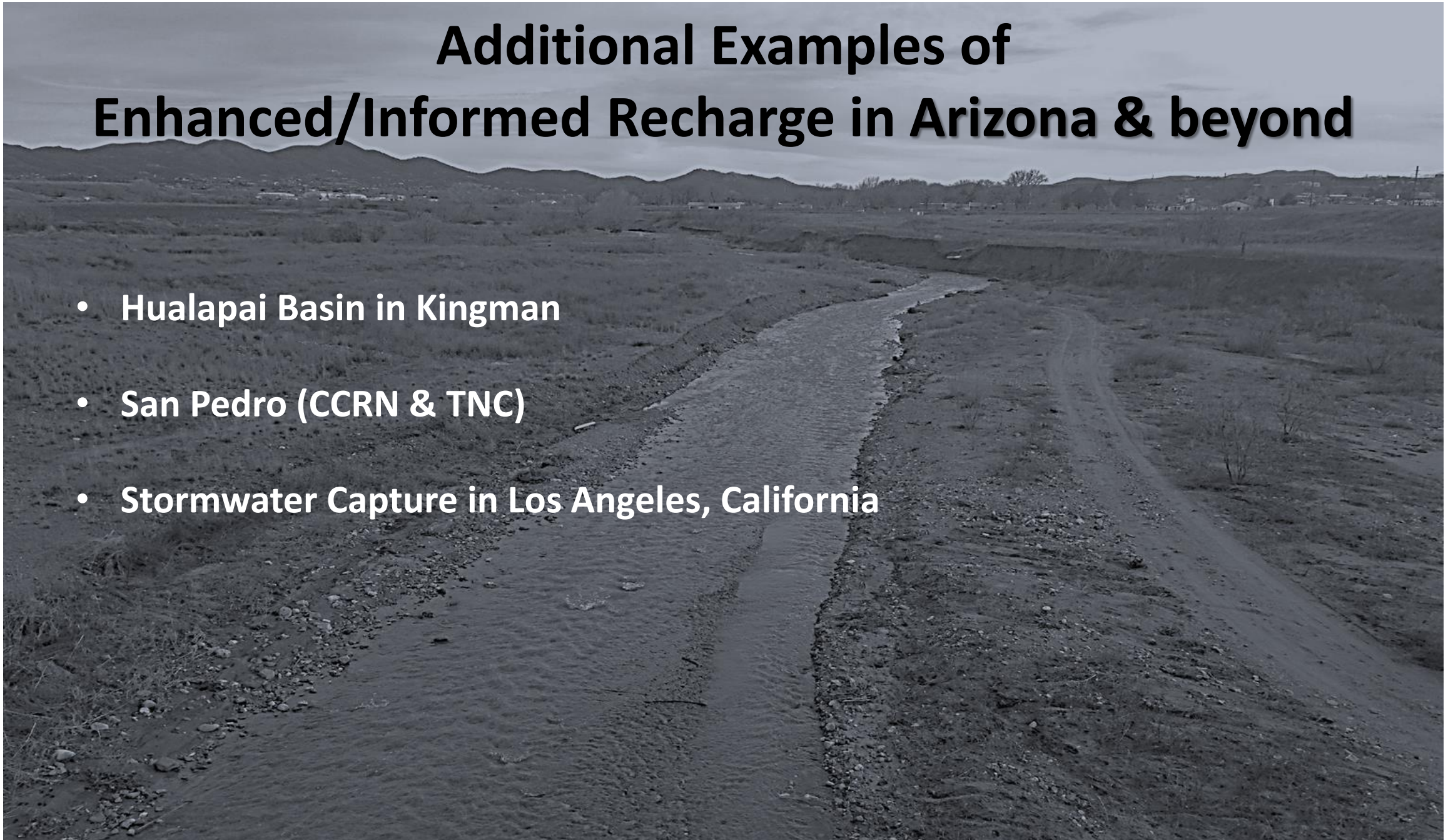
Potential for type of recharge dependent on hydrogeology

Mountain front recharge (MFR) vs. Concentrated flood recharge
Willcox & San Simon vs. Upper Santa Cruz; Upper Agua Fria; Gila



Additional Examples of Enhanced/Informed Recharge in Arizona & beyond

- **Hualapai Basin in Kingman**
- **San Pedro (CCRN & TNC)**
- **Stormwater Capture in Los Angeles, California**





Mohave County Development Services

Hualapai Valley Basin Groundwater Aquifer Conditions and Engineering Efforts for Improvements

February 20, 2018

Nick Hont, P.E.
Senior Engineer
Mohave County

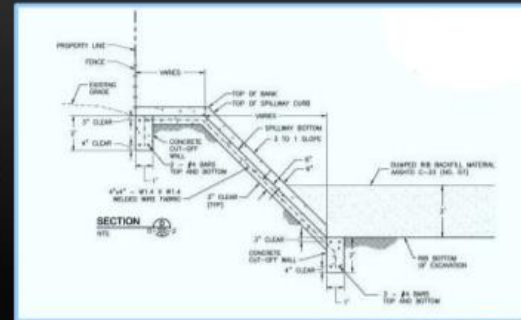


Mohave County Development Services



Mohave County Development Services

Quail Run Flood Control Infiltration Basin Constructed by Mohave County Flood Control District



Mohave County Development Services



Mohave County Development Services

Potential Infiltration Sites on Mohave Agrarian Property



Courtesy of Nick Hont/Mohave Co.

LADWP Stormwater Capture Presentation Slides

Stormwater Capture MASTER PLAN



GOALS

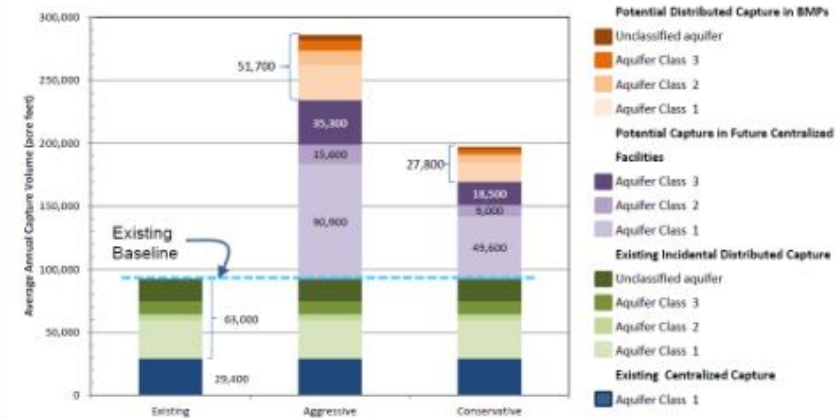
- Quantify stormwater capture potential
- Identify new projects/programs
- Prioritize based on water supply criteria
- Develop cost/benefits for proposed projects/programs
- Define timing and key milestones

PARTNERS



Stormwater Capture MASTER PLAN

Task 2: Existing & Potential Stormwater Capture



Stormwater Capture MASTER PLAN

Strathern Park

- Project consists of 3 infiltration basins to be excavated with Strathern Park
- The basins would accept runoff from a storm drain along the SR-170 Freeway (draining 320 acres) and overflow from Tujunga Spreading Grounds.
- **Estimated Recharge:**
1,000 to 1,500 AFY



**SE Valley,
September 2014
5" in 5 hours**



**Granite Creek,
monsoon 2014: Total
runoff = 5,240 AF**

Without enhanced and targeted recharge, the majority of precipitation from large storm events does not reach the aquifer, with an estimated average of ~95% lost to evapotranspiration in arid environments

Questions?

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Questions/Discussion

- What needs to be better understood from a technical, regulatory, or legislative perspective in order to move forward with these discussion?
- What hurdles will need to be overcome to make this a viable water augmentation solution?



IV. Storage Site Committee Update

Carol Ward, ADWR Deputy Assistant Director

V. Next Steps

